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11-9-2015

Photomask Defects Report

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Photomask Defects Report

Keywords
Photomask, Defects, Chrome Mask

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Photomask Defects Report

Updated on 3/20/2016

Critical Factors

- Transparency photomasks have inherent defects that are transferred onto the master
- Defects will be more pronounced for thin features (5-10um) with low dose
- Consider chrome masks if needed to minimize defects

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1. Transparency Photomask

SEM Imaged microfluidics wafer (KMPR-1025) in regions corresponding to previous images of photomask defects

- Observed large dark defects under white-light corresponding to defects in the photomask used to generate the master
- Under SEM imaging at high magnification, these defects in the KMPR master were actually found to be relatively unobtrusive, shallow depressions in the resist layer
- The defects of the photomask result in a “pocking” of the entire resist surface when viewed at high magnification
- When a mask defect resides at the edge of a resist feature, the defect can be seen to “widen” as one proceeds through the thickness of the resist from the top (free standing surface) to the bottom (Si surface)

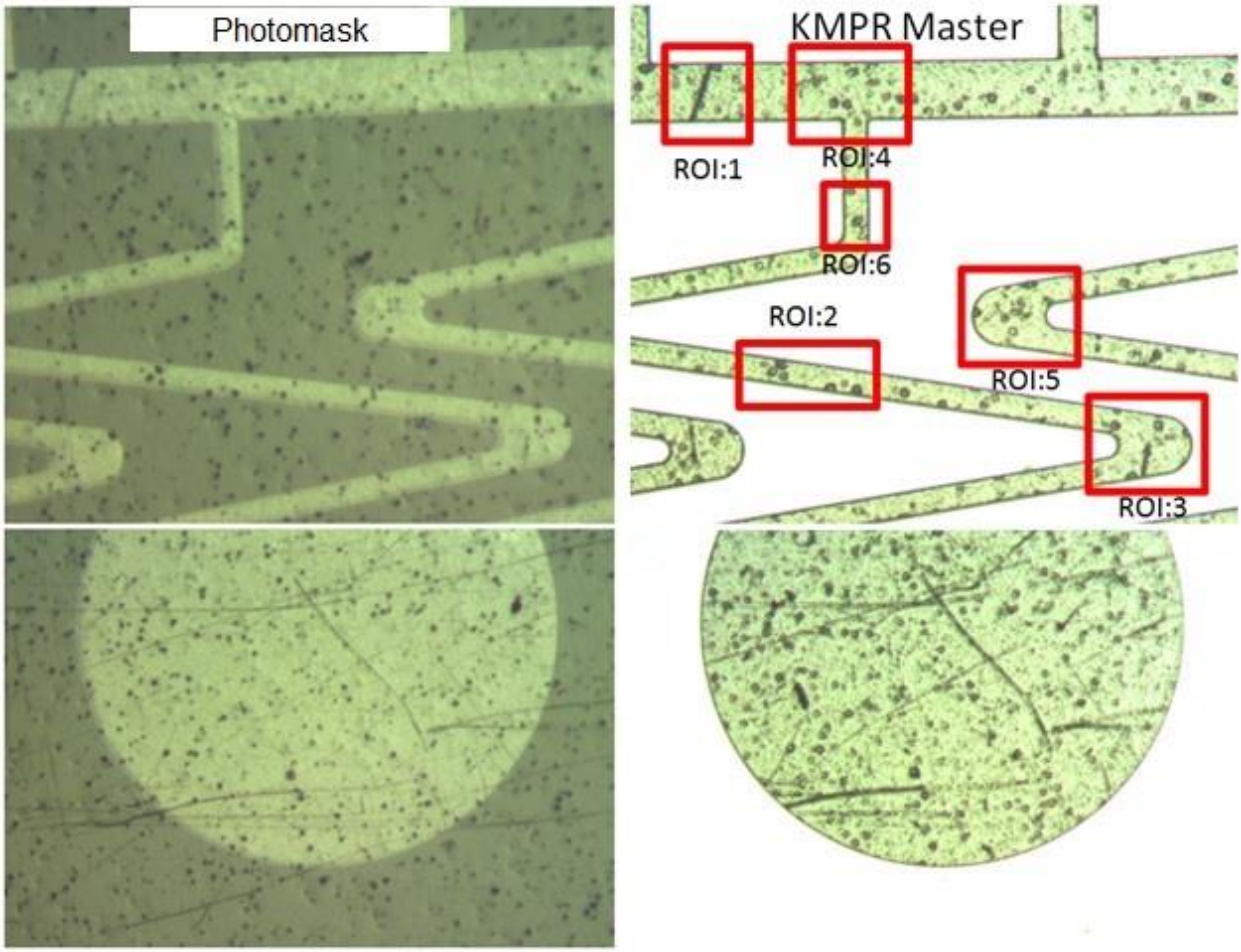

Figure 1: Images of photomasks and KMPR masters

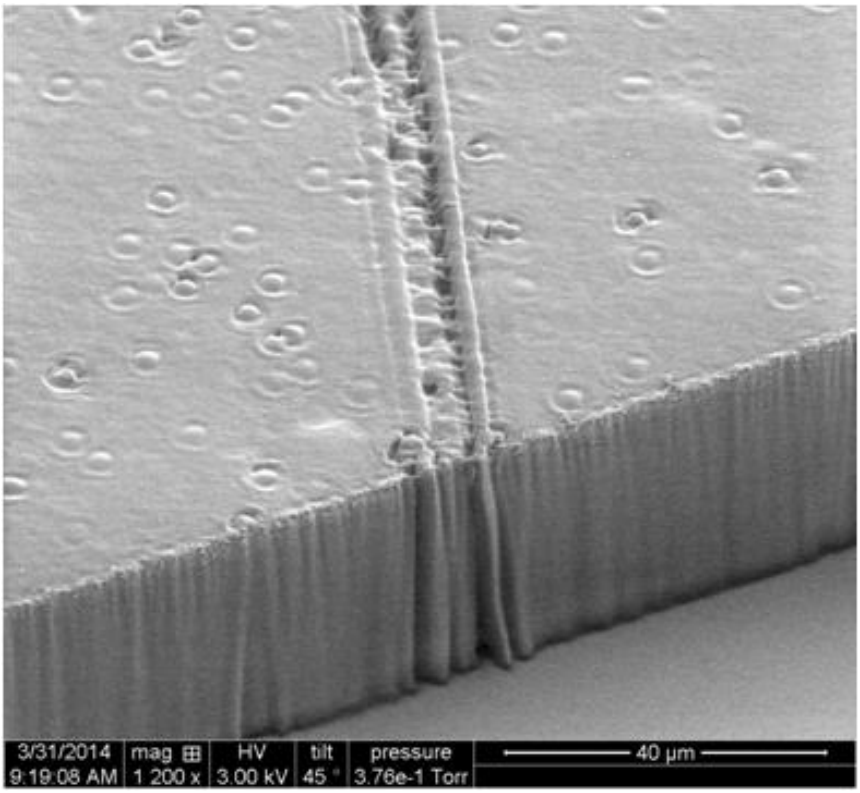

Figure 2: Region of Interest 1

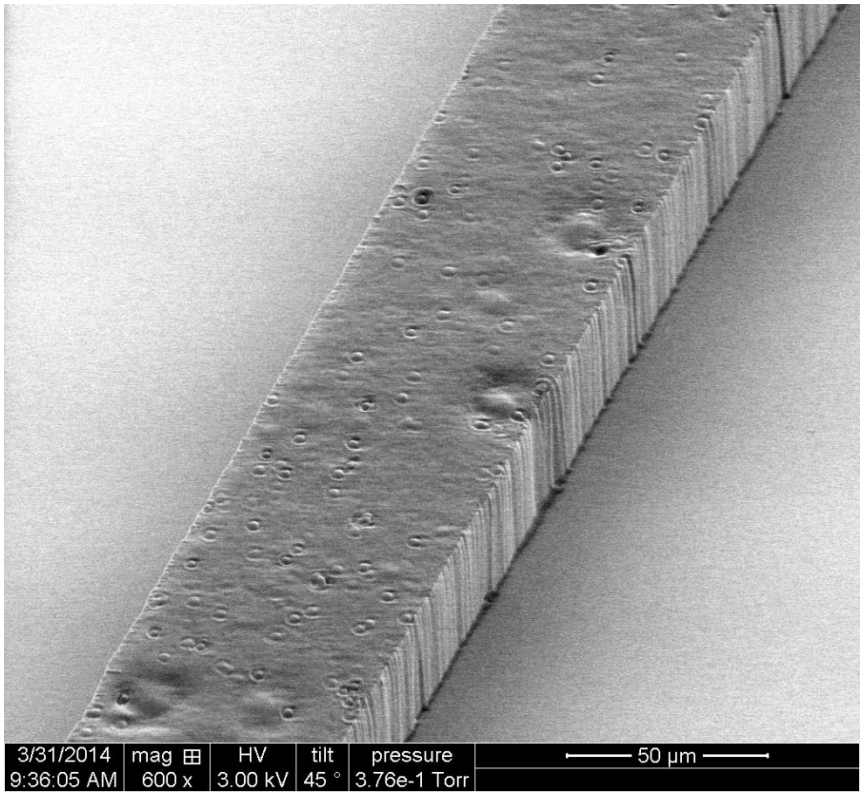

Figure 3: Region of Interest 2

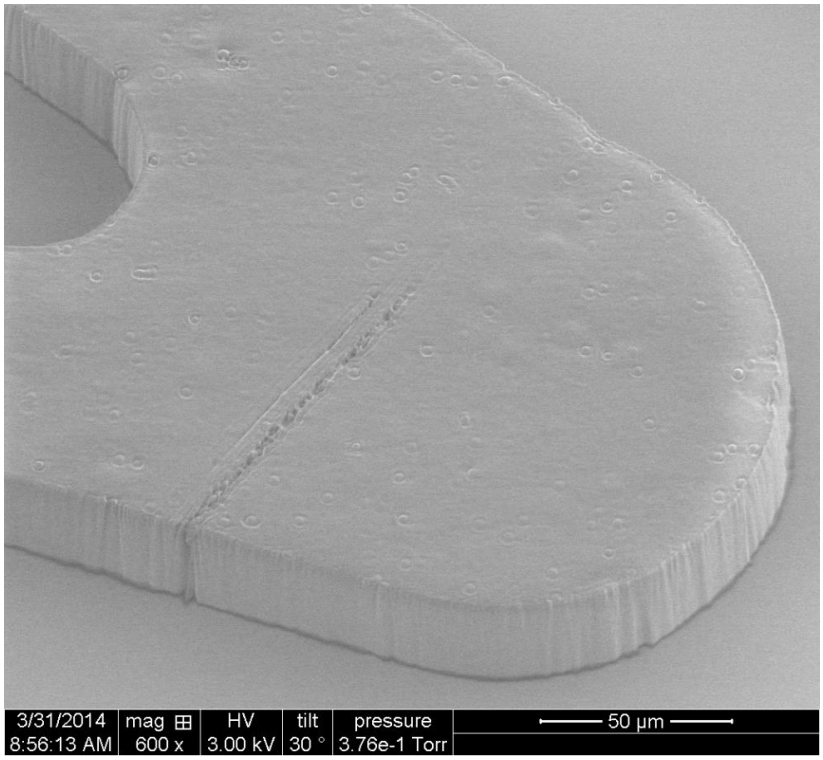

Figure 4: Region of Interest 3

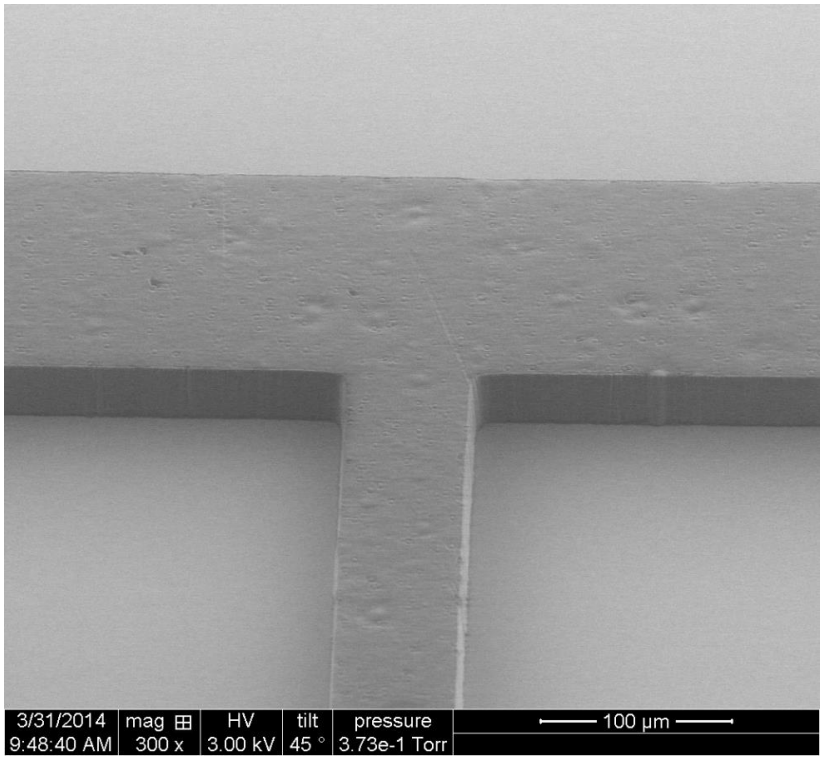

Figure 5: Region of Interest 4

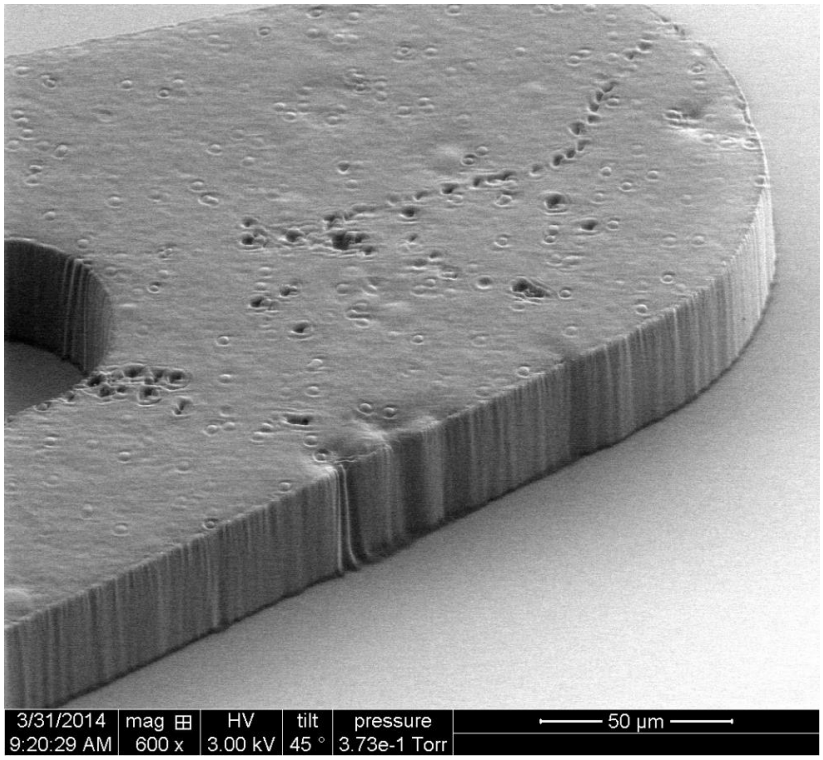

Figure 6: Region of Interest 5

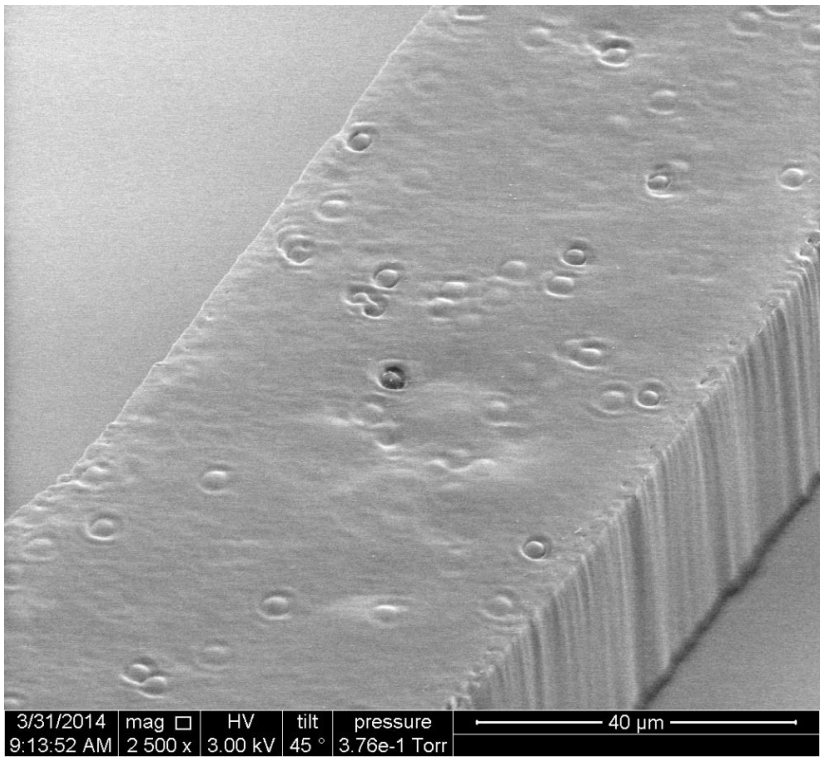

Figure 7: Region of Interest 6

2. Chrome Mask

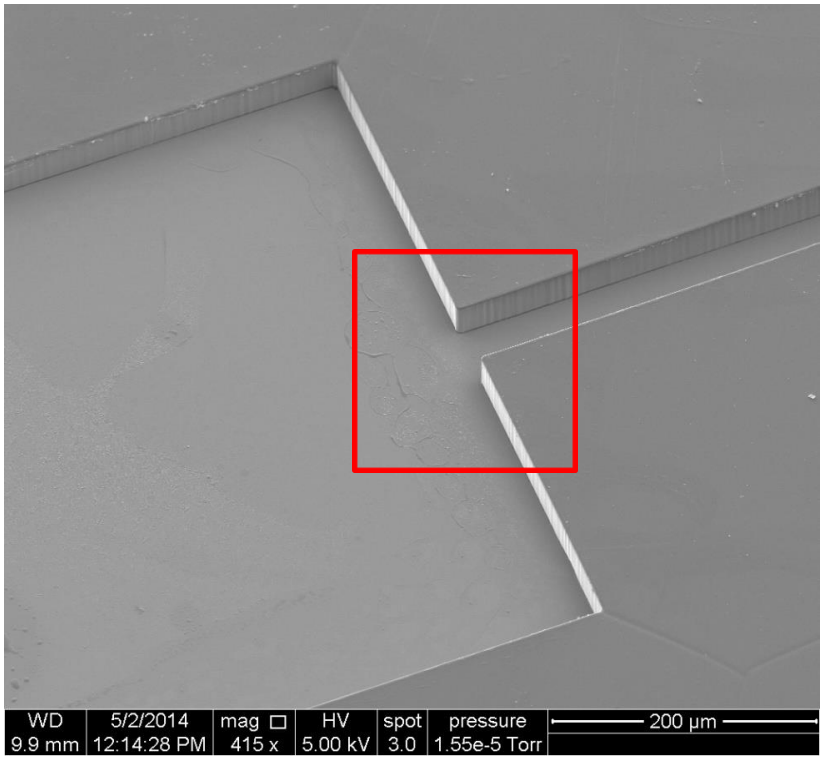

Figure 8: Image of chrome mask master sidewall

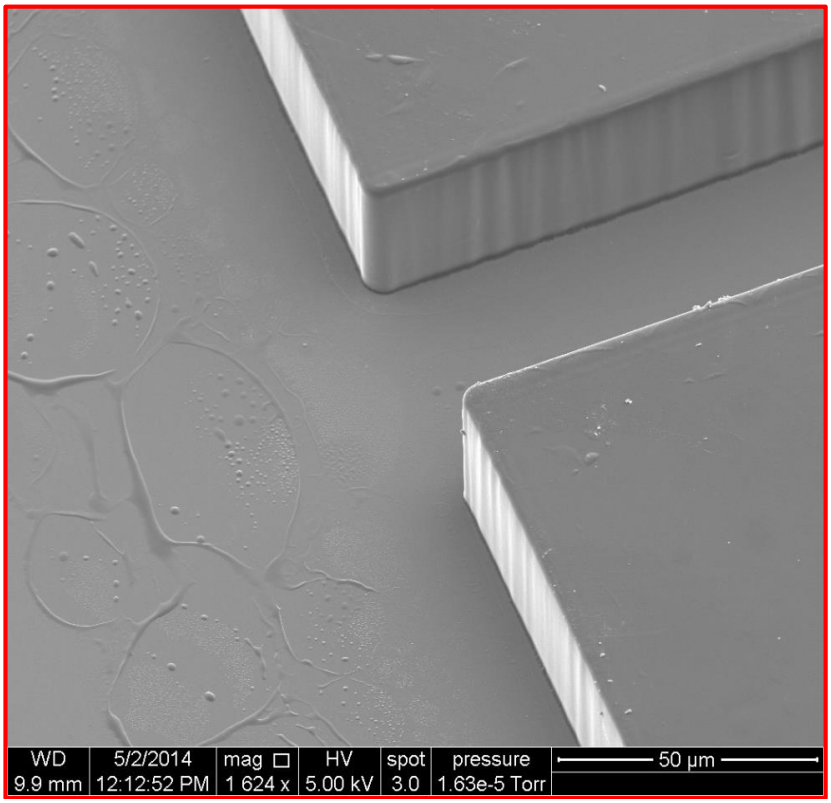

Figure 9: Magnified region of interest from Figure 8

3. Dose Effect on Resist

- All features are KMPR1005, 10um wide and 5um high
- Low dose results in more pronounce effect of photomask defects compared with chrome masks

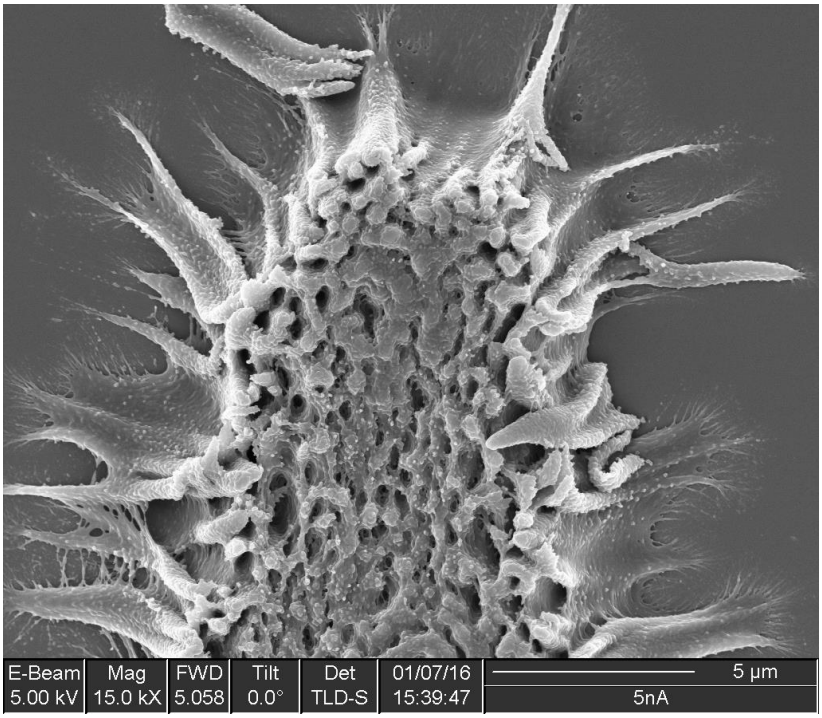

Figure 10: Photomask transparency, nominal dose

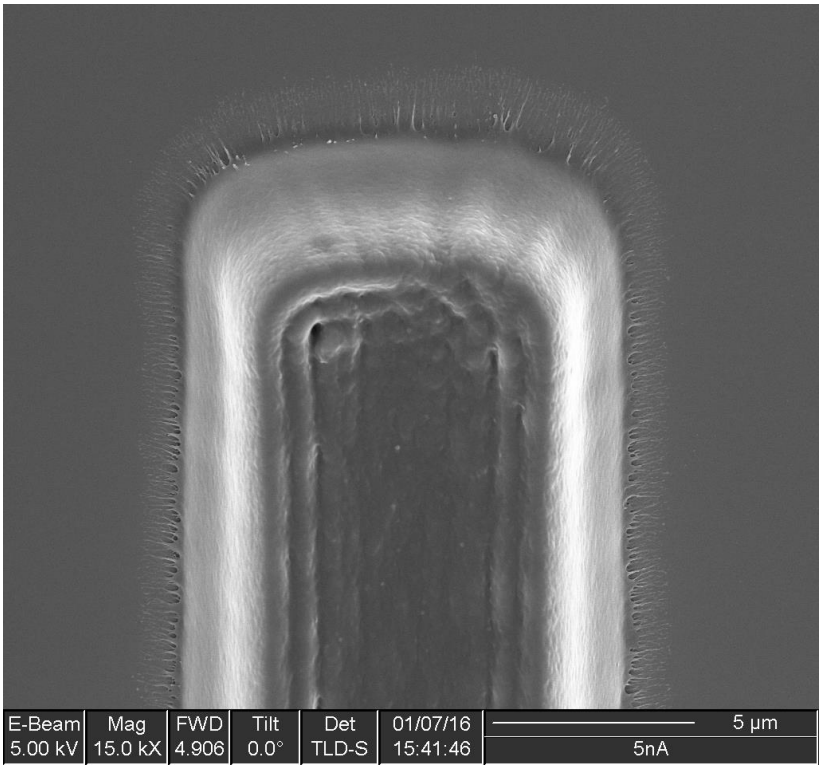

Figure 11: Chrome mask, nominal dose

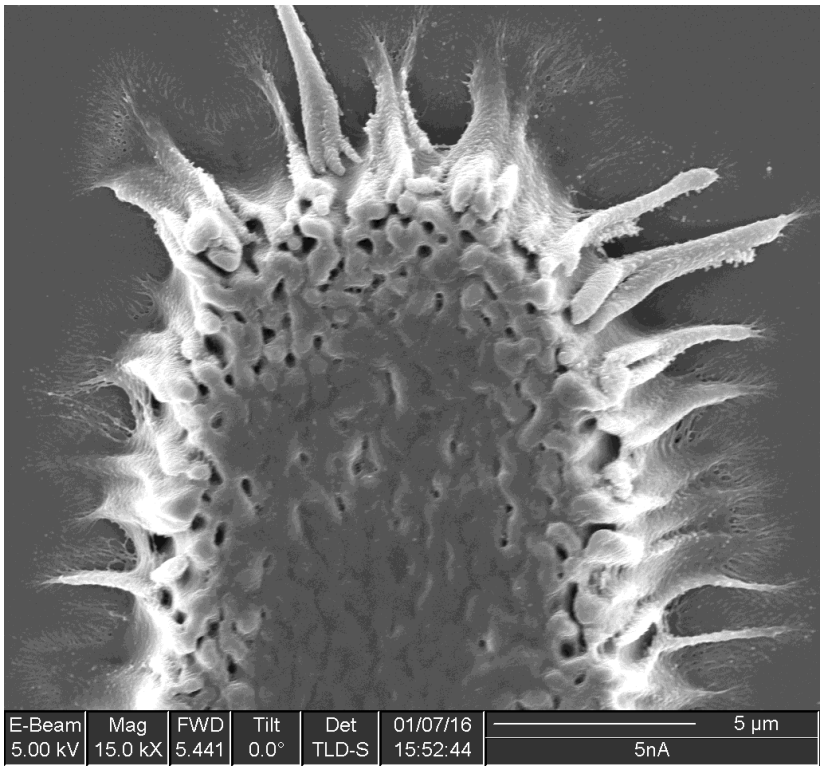

Figure 12: Photomask transparency, 25% above nominal dose

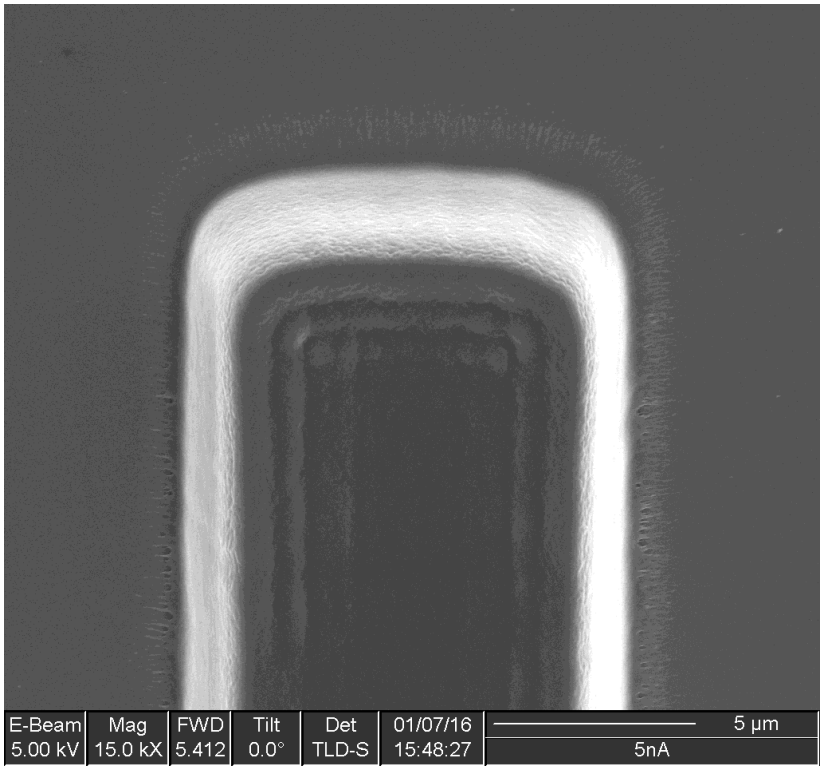

Figure 13: Chrome mask, 25% above nominal dose

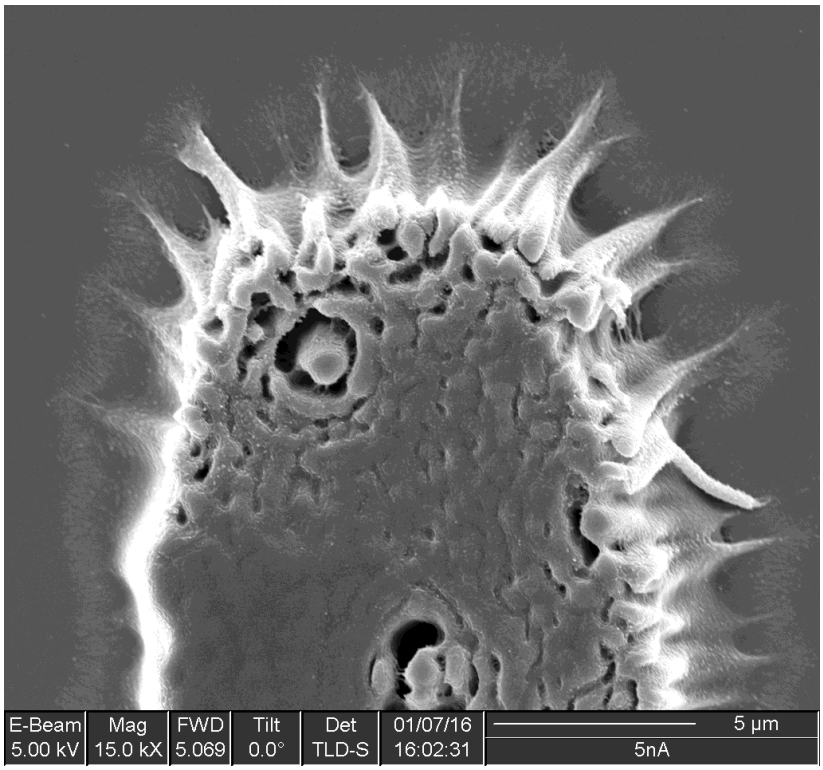

Figure 14: Photomask transparency, 50% above nominal dose

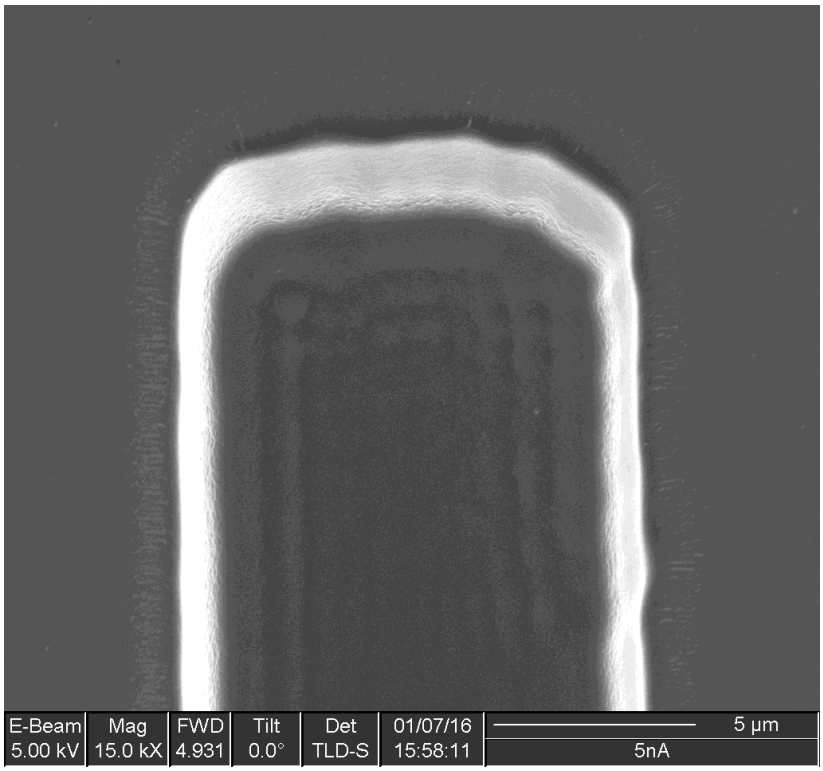

Figure 15: Chrome mask, 50% above nominal dose